

Gender Differences In Preferences Of Various Modalities Of Learning Styles Among Undergraduate Medical Students

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Abstract: Background: Learning style in students can vary by preferences of various modalities as visual (learning from graphs, charts, and flow diagrams), auditory (learning from speech), read-write (learning from reading and writing), and kinesthetic (learning from touch, hearing, smell, taste, and sight). These preferences can be assessed using the VARK questionnaire. The purpose of the study is to find if gender differences in learning style preferences is present among undergraduate students. Method: We administered the VARK questionnaire to 100 undergraduate students (50 males and 50 females). Result: The responses were assessed for gender difference in learning style preference. 54% of females and only 18 % of males preferred a single mode of information presentation. Among students preferring unimodal way of presentation the female students 30% preferred auditory mode, 2 % visual, 10% preferred printed words and 12 % preferred kinesthetic mode. In contrast, male students were evenly distributed in preference, with 8% of the students preferring auditory or kinesthetic mode each and 2% preferred reading mode. 46 % of female and 82 % of male preferred multiple modes. Conclusion: To conclude majority of males preferred multiple modes of information presentation. Male students may adjust to the different teaching styles. In contrast; the majority of female students preferred a single mode of information presentation. Although female learners can use all of the sensory modes in learning, one mode is dominant and preferred. Thus, male and female students have significantly different learning styles. It is the responsibility of the instructor to address this diversity of learning styles and develop appropriate learning approaches..

Key Words: Learning styles, VARK, gender, medical education.

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Introduction: Men and women are different but do these differences extend to learning styles? Do the evolutionary biology and the social influences have a say in the preferences in learning styles of the students? There is always an emotional debate regarding gender differences in various learning aspects. This debate is further inflamed by questions regarding “innate differences” between males and females and theories that claimed that women were biologically incapable of reason¹. We ask these questions because the answers may dramatically alter the ways in which we teach.

Male and female are physiologically different. These variances have a biological basis. These differences are found in various sense organs as well which may influence the pattern preferred in learning. In visual perception male eyes are generally more sensitive to motion whereas female eyes are more sensitive to color differentiation². This is due to the difference in distribution of rods and cones in the eye.

Females are also more sensitive to sound than males². Apart from this male and female brains vary in their myelination, structure, function, and chemistry³. Brain volume is greater in men than women and women have a higher percentage of gray matter and men a higher percentage of white matter. Global cerebral blood flow is higher in women than in men. Sex-specific differences indicate that male and female brains are neurochemically distinct⁴. Some of these brain differences can be seen during puberty and in females are linked to sex hormones. Gender based differences in vision, hearing, and brain structure should be important to classroom educators because these factors affect how students perceive and process information about the world. If teachers can better understand the biological variance between the genders then they can be better prepared to anticipate and accommodate their student's needs.

If teaching approach are adapted to meet the different learning style preferences of the

students it can improve their performances⁵. Learning style preferences are the manner in which, and the conditions under which, learners most efficiently and effectively perceive, process, store, and recall what they are attempting to learn⁶. Knowing the students learning style preferences and the gender differences will aide in the development of the most effective teaching approaches⁷.

There are a number of different ways to define and assess learning styles, but one of the more practical and recently popular ways to do so is according to the sensory modality that one most prefers to use when learning. As Bruner⁸ and Piaget⁹ observed, the four different sensory modalities that humans use to assimilate information are visual, auditory, reading/writing, and kinesthetic (VARK). Flemming than built on this concept an online questionnaire¹⁰ that categorizes learning styles on the basis of VARK modality preferences.

Learners with a V preference learn best by seeing or observing (drawings, pictures, diagrams, demonstrations, etc.). Learners that prefer an are best suited to learn by listening to or recording lectures, discussing material, and talking through material with themselves or others. R-type learners learn through interactions with textual materials. K-style learners perform best by using physical experiences: touching, performing an activity, moving, lessons that emphasize doing, and manipulation of objects

Although no student is restricted to only one sensory mode for learning, a stronger preference for one particular mode may exist. According to the VARK questionnaire, the first preference is the sensory modality that obtains the highest score, and, depending on the score distribution among the four sensory modalities, there are unimodal and multimodal (bimodal, trimodal, and quadmodal) students¹¹.

Through this study we were interested in assessing the preferred learning styles of students to determine if males and females have similar learning styles. To achieve these

Aim, we tested the hypothesis that males and females have different learning style preferences. Fleming's¹⁰ VARK inventory tool (version 7.2) for assessing individual learning style preferences was administered to our students.

Material and Method: To test the hypothesis that males and females have different learning style preferences, the VARK questionnaire developed by Fleming was administered to our undergraduate students. VARK was selected due to its ease of use (a simple 16-question survey), it (English version) was recently validated¹², its free availability online for both students in this study and for readers of this article who may wish to use this tool in their classroom. In addition, this tool offers both students and instructors a method to enhance student learning by better understanding preferred modes of information transfer.

100 undergraduate physiology students, 50 males and 50 females from B.J. Medical College (admitted in 2012) participated in this study. The english version of the VARK test which is a self-reported multiple-choice questionnaire was given to the students in hard copy and were asked to fill in their responses. Students were informed that there were no right or wrong answers. Other relevant explanations, such as "answers should represent what you would really do in the context of each question and not what you believe is expected to be done" were also given to them .

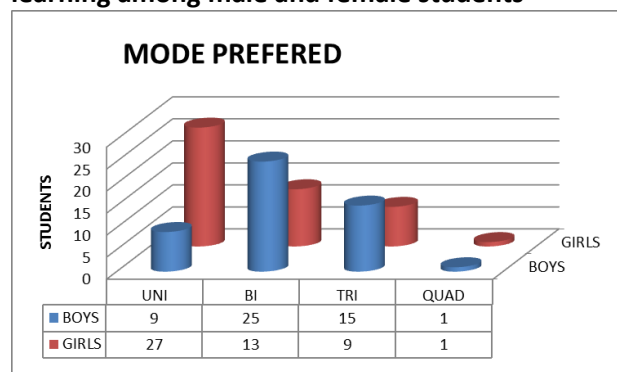
Their responses were categorized according to the scoring chart of the VARK questionnaire. The 100 students that participated in the study were classified according to their preferred sensory modality for learning as V, A, R, or K learners. The preferred sensory modality was the modality that obtained the highest score in each individual VARK questionnaire. When two or more sensory modalities got the same first score (tied) they were classified as bimodal, trimodal or quadmodal depending on number of sensory modalities with same first score. Thus the scoring also allowed discrimination between students that mainly use one sensory

modality for learning (unimodal students) and those that use two or more sensory modalities (multimodal students).

Data are reported as percentages of students in each category of learning style preference. The number of students who preferred each mode of learning was divided by the total number of responses to determine the percentage.

Result: Most females preferred unimodal learning, whereas males preferred multimodal learning. Specifically, 54% of females and only 18% of males preferred a single mode of information presentation. Of the females who preferred multiple modes of information presentation 46%, 26 % of the students preferred two modes (bimodal), 18% of the students preferred three modes (trimodal), and 2% of the students preferred four modes (quadmodal). Of the males who preferred multiple modes of information presentation (82%), some preferred two modes (bimodal, 50%), three modes (trimodal, 30%), or four modes (quadmodal, 2%).

Fig 1: Preferences of different sensory mode of learning among male and female students

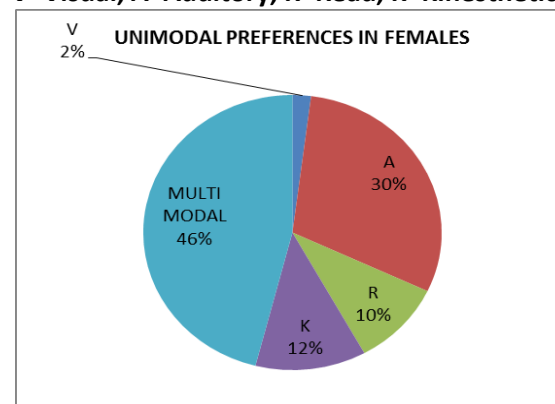


Of the female unimodal learners, 2% of the students preferred V, 30% of the students preferred A, 10% of the students preferred R, and 12% of the students preferred K. In contrast, males were evenly distributed in unimodal preference with 8 % of the students preferring A or K, 2% of the students preferred A, whereas 0% of the students preferred V.

Among the students who preferred bimodal in females (26%), 4% preferred V with A, and R with K each, while 10% preferred A with R, 8%

preferred A with K. Among bimodal male (50%), 22% preferred A with K, 2% preferred V with K, 6% preferred R with K, 16% preferred A with R, and 4% preferred A with V. Of the female students who preferred three modes of information presentation, some students preferred V, R, and K (2%), some students preferred V, A, and K (6 %), some students preferred V, A, and R (6 %), and some students preferred A, R, and K (4%). Of the male students who preferred three modes of information presentation some students preferred V, A, and K (12 %), some students preferred V, A, and R (8 %), and some students preferred A, R, and K (10%). Both the groups had 2% students who preferred all four modes V, A, R and K equally and were quadmodal.

Fig 2A: Unimodal preferences in females
V=Visual, A=Auditory, R=Read, K=Kinesthetic



Bimodal was the preferred style among male multimodal learners, whereas females had a variety of preferences.

Fig 2B: Unimodal preferences in males
V=Visual, A=Auditory, R=Read, K=Kinesthetic.

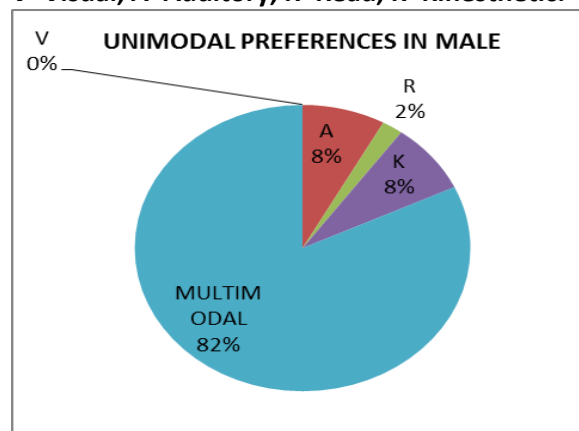


Fig 3A: Multimodal preferences in females
V=Visual, A=Auditory, R=Read, K=Kinesthetic

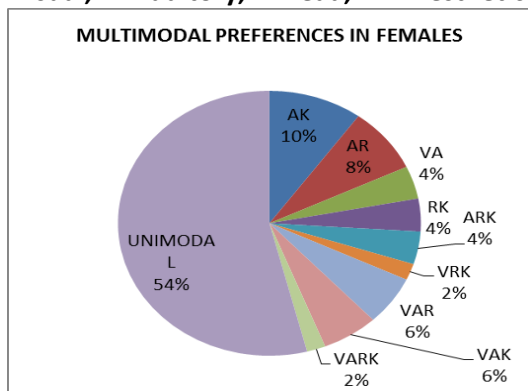
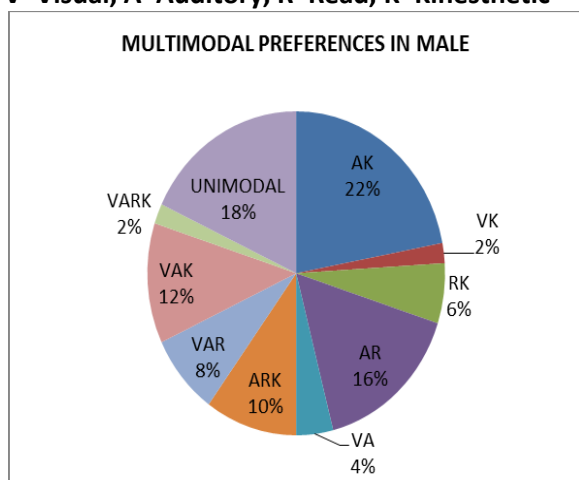


Fig 3B: Multimodal preferences in males
V=Visual, A=Auditory, R=Read, K=Kinesthetic



Discussion: The purpose of the study was to assess gender differences in learning style preferences among undergraduate students. This study was performed as a follow up to Lujan and DiCarlo's assessment of learning styles preferences among first-year medical students, which showed that among medical students, only 36.1% of the students preferred a single mode of information presentation. In contrast, most students (63.8%) preferred multiple modes of information presentation⁵. In that study, the authors suggested that gender differences in learning preferences be assessed. To address this important issue, we administered the VARK questionnaire to undergraduate students and asked students to voluntarily provide information. The responses were tallied and assessed for gender differences in learning style preferences. Importantly, 82 % of males but only 46 % of females preferred

multiple modes of presentation. This result in accordance to another study on undergraduate physiology majors students enrolled in a capstone physiology laboratory at Michigan State University¹³. Thus, in contrast to females, the majority of males preferred multiple modes of information presentation. Male students may adjust to the different teaching styles faced in a day or they may opt in and out of alternative strategies, such as being visual in cardiovascular physiology and reading/ writing in respiratory physiology, for example¹⁴.

In contrast, the majority of female students (54%) preferred a single mode of information presentation, either V, A, R, or K. Unlike male students, females preferred information to be presented in a single mode. Although female learners can use all of the sensory modes in learning, one mode is dominant and preferred. Some students, male or female, may prefer one of the modalities over the others so strongly that they struggle to understand the subject matter unless special care is taken to present it in their preference mode. The knowledge of student preferred learning styles is vital if we, as educators, can provide tailored strategies for individual students¹⁴. Knowing students preferred learning style also helps to overcome the predisposition of many educators to treat all students in a similar way¹⁴ as well as motivate teachers to move from their preferred modes to using others. In so doing, they can reach more students because of the better match between teacher and learner styles^{5,15, 16, 17, 18}.

The results of the VARK questionnaire should convince teachers to use multiple modes of information presentation. This may require instructors to stray from their own preferred modes of teaching and learn to use a variety of styles, which will positively affect learning.

In some cases, it may be difficult to tailor coursework to the individual learning styles of each student. However, in these situations, by being aware of their learning style, the students may contribute to their academic success by promoting self-awareness and their use of

learning strategies that work for their learning style. A gender-based preference in learning style is one area in which males and females are unique. It has been reported that males have a preference for rational evaluation and logic, whereas females use “elaborative” processing in which they tend to seek personal relevance or individual connections with the material being taught¹⁹. In addition, males tend to be more achievement oriented, whereas females are more socially and performance oriented²⁰. The genders also differ in their beliefs about what is most important to student learning, with females ranking social interaction with other students and self-confidence as higher than males²¹. Furthermore, males are likely to attribute their success in the classroom to external causes, such as teaching, whereas females generally see their success as being directly related to their efforts in the classroom²². This suggests that males tend to be more externally focused, but females tend to be more introspective and self-critical.

The VARK philosophy encourages a belief that everyone can learn if their preferences are addressed. In addition, VARK encourages teachers to respect differences and reject negative judgments about learners. VARK promotes the idea that students are able to learn in different ways, providing that the Method of teaching are appropriate to the student’s preferences.

VARK also has support among practitioners and encourages a range of teaching and assessment techniques. VARK encourages flexibility and imagination in designing resources and in changing environmental conditions. It changes the teachers focus as they begin to respond more sensitively to the different learning preferences of their students. VARK also encourages teachers to re examine their own learning and teaching styles.

Future directions. It has been established that there are a variety of learning styles present in the classroom, and, as such, there are some students that are not reached by the standard lecture format. Furthermore, this study demonstrated that there are gender differences

in learning styles such that males tend to be multimodal and females tend to be unimodal. Several issues still need to be addressed. In particular, does learning style preference correlate with performance? Does student knowledge of their learning style allow them to perform better by adapting the information to their own preferred modality while studying or by finding study partners that can present the material in an alternative manner? Do K-style learners have the advantage in hands-on laboratory courses? Do A-style learners excel in the standard lecture format? Importantly, how does the accommodating to learning preference really alter learning outcomes?

Conclusion: Student learning style preferences can be determined by the use of the VARK questionnaire, which can assist both the learner and educator in identifying individual student preferences in the manner in which information is presented. There is a significant difference in learning style preferences between males and females. As such, it is the responsibility of the instructor and the student to be aware of student learning style preferences to improve learning. As instructors, we need to assess and understand how to reach all students by understanding how to present information in multiple modes. We can help students more effectively; both in and out of the classroom, if we are aware of their learning style and can assist them in determining their preferences. As a student, it is vital to be self-aware of preferences to adjust study techniques to best fit each individual, even when the information and instruction provided does not match the preferred style.

It is important to note that the results do not suggest that there is an innate difference in aptitude between genders²³, nor is it promoting separation of genders in the learning process (i.e., separate science classes for males and females). This study asserts that males and females have difference preferences in learning style. As suggested by Lie et al. This actually supports mixed gender classrooms and study groups to allow both genders the opportunity to learn from each other.

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